Determinants of Medical Insurance Participation in Rural China

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Abstract

While China experienced rapid economic growth in the past decade, development of health care has lagged in comparison. After the collapse of the previous insurance system in the late 1970s, continuing healthcare reforms have been implemented to promote healthcare access, especially for rural households. Although research has been done to assess the outcomes of the health care reforms in China, limited studies have been done to analyze the decision-making behavior of rural households. This study investigates the impact of healthcare access on insurance participation rate in rural China. The data for this study was extracted from the China Nutrition and Health survey, a longitudinal dataset collected by the Carolina Population Center at UNC. Probit regressions were utilized to estimate the effects of healthcare access factors on insurance participation rate. The estimation results indicated that travelling time and waiting time to receive healthcare negatively impact the probability of having medical insurance. On the other hand, cost of travelling, cost of common cold treatment and the availability of necessary medicines increase the probability of having medical insurance. Among the control variables, presence of chronic illness, higher education level and employment in labor-intensive occupation contribute most significantly and positively to having medical insurance. Thus the specified decision-driving factors of this study are found to be consistent with previous research in health-seeking behavior. The result of this research suggests that additional services to improve access can further improve health insurance and healthcare utilization in rural China.

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I. Introduction

While China experienced rapid economic growth and urbanization in the past decade, development of health care has lagged in comparison. The cost of healthcare has increased at a higher rate than the rate of economic growth. From 2004 to 2012, China's GDP tripled from $1.9 trillion to $8.2 trillion, while per capita expenditure on health had a fourfold increase from $54.1 to $278.0 from 2002 to 2011 (World Health Organization (WHO) Global Health Observatory). Although healthcare is often considered as an inelastic good, the price of healthcare can impact one's decision to seek proper medical attention. Continuing increase in medical costs can inhibit individuals from seeking proper healthcare and lead to poor health. Studies have found that households experience poverty as a consequence of poor health (Geneva: WHO). The downward spiral of living standards due to poverty and poor health demonstrates the need for urgent attention to the problem of rising health care costs. As WHO argues, one of the most important functions of health systems is fairness of healthcare financing where risk is shared evenly within a society. For this reason, health insurance becomes an obvious solution to promote health quality in a community. As one of the most common method of risk-pooling, medical insurance can significantly affect healthcare-seeking behavior and facilitate healthcare equality.

After the Chinese Communist Party took over China in 1949, the central government saw the most need in the rural areas for healthcare reform (Lu et al., 1995). Rural Cooperative Medical System (RCMS) was established to provide affordable medical services in rural areas where agriculture was the significant sector. The program was organized in three tiers: barefoot doctors, township health centers and county hospitals.

Patients with more serious illness were referred to the higher level of medical facilities. By late 1970s, 90% of the rural population was covered by RCMS. However, as market reforms and urbanization took place since 1979, the economic landscape transformed drastically and agricultural sector was replaced by manufacturing sector. The rapid change in social and economic structures led to the lack of control and funding, and eventually the collapse of the program. As a result, the medical coverage rate fell drastically, from 90% in 1980 to 5% in 1985 (Liu and Cao, 1992). Rural and low-income households struggled severely to access healthcare, due to rising medical costs, lack of government support and limited medical service.

In 2003, the New Rural Cooperative Medical System (NRCMS) was implemented to alleviate the medical burden for families in rural areas. The new system is a local government-run insurance program. Households can participate voluntarily by paying a heavily subsidized premium to receive insurance coverage. The NRCMS resulted in modest reduction in healthcare spending as a proportion of household income (Sun et al., 2009). While the new policy was deemed as successful, some improvements still need to be made to fully benefit the society. For example, since local clinics can only treat acute illness, rural farmers with chronic diseases have to visit the higher-level and often distant facilities to receive treatment. The lack of financial and physical access may decrease the affordability of healthcare (Klotzbücher et al., 2010). Also, reports have shown that the major proportion of NRCMS reimbursement is allotted for in-patient care, indicating that affordability of out-patient health service for acute or less severe illness has not effectively improved (Yip and Hsiao, 2009). As such, the mismatch in demand and

supply of insurance coverage and subsidized medical services prevents the system to be fully effective.

Because NRCMS is a voluntary insurance system, individuals have the choice of whether to participate in the program or not. As Buntin, Marquis and Yegian (2004) suggest, both supply and demand are essential to maintain the continuity of an insurance scheme. The information on participation drivers is necessary for insurers to construct an attractive and beneficial insurance policy. The plan and its implementation must be tailored to the households or individuals to maximize voluntary participation rate. Since insurance itself does not provide direct medical benefits, healthcare access may be a significant decision factor for customers. The primary goal of this research is to investigate the effect of healthcare access, in terms of time, cost and availability of medical attention, on health insurance participation rate in rural China.

II. Literature Review

Since this paper aims to investigate healthcare access and insurance participation rates in rural China, the literature review will be presented in three sections. The nature and outcome of the New Rural Cooperative Medical Scheme (NRCMS or NCMS) will be reviewed in the first section. The second section will establish the theoretical basis of the proposed effect of healthcare access on insurance participate rates. Finally, the last section will review previous studies on customer behavior for healthcare access to provide the foundation of the model for this study.

a. Studies on New Cooperative Medical Scheme

Numerous studies have been conducted on the New Cooperative Medical Scheme in China. Most of these studies have focused on the descriptive analysis of the healthcare reform in China. For example, Mao (2005) described the pilot program of NCMS in its first year in great detail and summarized its financial outcome. Also, Brown (2009) investigated the different variations of the plans implemented by various county-level governments. Brown's study found that households were less likely to receive reimbursement when counties require referrals or limit treatment to approved hospitals.

Other researchers have also investigated the causal effect of NCSM. Using the differences-in-differences technique, Wagstaff et al. (2009) found that while healthcare utilization rate has increased, average out-of-pocket expenses have not been reduced. In related research, Brown and Theoharides (2009) found that health-seeking behavior and choice of hospital facilities are strongly influenced by different reimbursement schemes. As a control variable in the study, cost of travel was found to have an ambiguous effect on health-seeking behavior. Wang et al. (2008) evaluated the success of NCSM by conducting a social experiment, where some counties were randomly assigned to a control group while the others were selected for Rural Mutual Health Care, an insurance program providing coverage for in- and out-patient services. Wang et al.'s study found that the implementation of the insurance program increased the utilization of outpatient services. These studies set the precedent for the link between insurance and healthcare access. While many studies have found that insurance participation tends to increase access to medical care, to my knowledge, there are no studies that have investigated the

reverse effect. That is, whether the ability to access healthcare influences households' decisions to participate in medical insurance. Because insurance itself does not provide any direct tangible benefit, physical access to medical care is an essential factor for designing healthcare reform. The research in this paper will be an important contribution to the literature as the findings will be useful to understand the importance of health care access in household decisions.

b. Theoretical basis of health insurance and access to healthcare

Conventional theory considers insurance as a risk-avoiding tool, where risk-adverse individuals pay a small fee upfront to avoid potential large costs or losses in the future. For health insurance, people pay a relatively small premium to avoid the risk of a large medical cost if illness occurs. The perceived risk of illness involves a substantial amount of uncertainty as becoming sick happens randomly. By entering a risk pool such as a medical insurance, the variability of medical costs can be lessened for individuals.

However, there are some problems that might occur in the market for insurance. Asymmetric information between insurers and consumers can lead to allocation inefficiency, notably due to adverse selection and moral hazard. Adverse selection occurs when more high-risk people join or purchase more health insurance, lowering the quality of the risk pool. On the other hand, moral hazard occurs when people buy unnecessary products or behave more recklessly when having insurance, leading to higher social costs (Rothschild and Stiglitz, 1976). While these problems have been recognized to exist in many cases, some researchers have also argued that the moral hazard problem might not be a severe one. For example, empirical research has shown that participation in health

insurance typically increases the health of individuals greatly, suggesting that the magnitude of moral hazard is not as severe as risk-avoidance models have indicated (Nyman, 1999).

In 2003, Nyman's access theory proposed an alternative explanation of the demand for health insurance. Nyman's access theory states that people purchase insurance to obtain additional income to afford medical care when illness occurs. By paying the premium, the patients would have access to the risk pool for a larger sum of payout to cover medical costs. In other words, insurance policy acts as an income transferring agent, distributing money from healthy public to sick individuals (Santerre and Neun, 2009). The access to the additional income is determined by medical facilities in forms of diagnosis and treatment, and then the actual income is obtained through reimbursement. The access to healthcare thus becomes a determinant factor to obtain the additional income, making physical access more important than before.

While financial access is often the main focus of insurance-related dialogue, geographical factors of access also contribute to the ability of individuals to seek healthcare. The time to travel and cost of travel to get medical care are very important factors that influence the ability of individuals to seek health care. To encompass various factors when defining healthcare access, Aday and Andersen (1974) proposed a framework involving health policy, population characteristics, healthcare delivery system, service utilization and consumer satisfaction, as shown in figure 1. The combination of multiple factors contributes to the medical care access, in addition to the financial costs of health care.

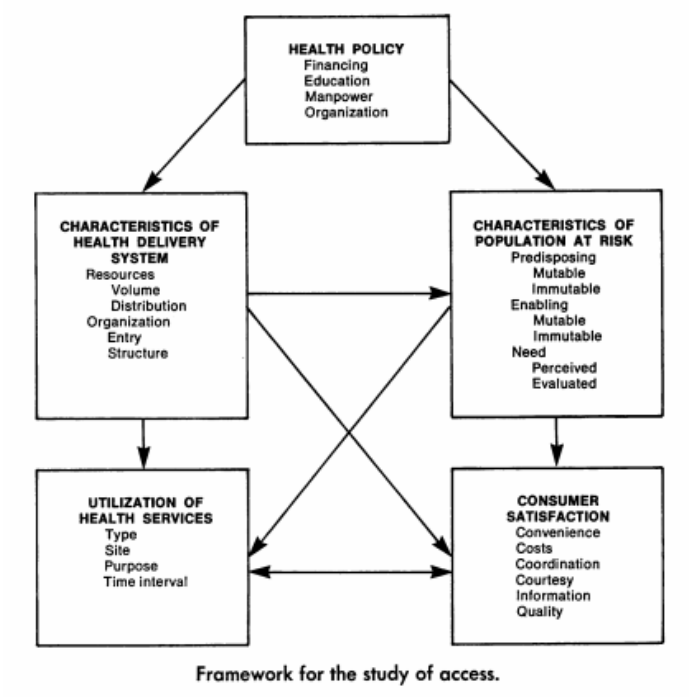

Figure 1 - Andersen model for Healthcare Access

There are studies in the literature that have focused on utilization and consumer satisfaction and have shown that spatial access to healthcare is a significant factor that affects demand for healthcare. For residents in rural regions, distance is especially critical, as medical centers are scarce compared to urban areas. People are generally averse to long distance and prefer shorter travel. For instance, Borah (2006) found that people in rural India prefer lesser distance to a health facility over a farther one. Qian et al (2009) have also found similar results in Gansu, China. Specifically, Qian et al. found that people generally prefer closer hospitals; however, distance becomes less significant when illness is severe or quality of care is important. With need and access as part of consideration, distance and the quality of medical facilities can affect an individual's

healthcare-seeking behavior and in turn influence the decision to purchase health insurance.

While the effect of financial access on healthcare is extensively investigated, the limited research that exists on the relationship between insurance participation and spatial access to healthcare also motivates the research in this paper. In addition, while distance generally is positively correlated to time spent travelling, this study will use travelling time to reflect individuals' decisions more accurately (Phibbs and Luft, 1995).

c. Determinants of medical insurance participation

As noted in the previous section, adverse selection and moral hazard often contribute to inefficiency in insurance programs. While both can influence the outcome of insurance policy, adverse selection primarily takes place during decision before purchasing insurance, while moral hazard occurs after having insurance. Adverse selection refers to the scenario where people with higher risk participate in insurance more than others, inhibiting the purpose of spreading risk. In other words, healthcare utilization may increase with implementation of affordable insurance, because people who enroll are likely to be in poor health or already access healthcare more often than the rest of the population. The adverse selection can introduce bias in examining insurance policies. This issue was taken into account by Yu et al. (2010) when investigating the effectiveness of the New Cooperative Medical Scheme. By using perceived health status as a control factor for adverse selection, Yu et al. found that NCMS has minimal presence of adverse selection, indicating that the negative effect can be minimized through proper policy design.

There are few existing studies that have investigated the determinants of medical insurance demand. Mhere's (2013) study in Zimbabwe is very notable in this category. Mhere's research assesses the determinants of health insurance demand in Zimbabwe. The probability to participate in health insurance is defined as a function of income, education, age, age squared, size of family, sex, marital status, type of job, employment status and chronic illness. Mhere's results using a probit regression indicated that household head's age, education and income are positively related to the probability of enrolling in medical insurance program. It was also found that households who have at least one member with chronic illness are also more likely to seek insurance coverage. Although this study is on medical insurance in a developing country that is in a different continent, it still will be very useful for my research as it provides the basis and framework for my study on medical insurance in China.

In related research, Ying et al. (2007) estimate the willingness to pay for private health in Chinese urban areas by using a logistic regression. Their research found that people who are under 40 years old, college educated and with higher income are more likely to purchase private insurance. The authors further recommend using the coefficients of these factors to estimate market size for an insurance market. The research in my paper will further extend Ying et al.'s recommendation by including physical access to medical care as a factor of demand estimation for health insurance market. My study will differ from Ying et al. in a very significant way. While Ying et al.'s study examined private health insurance participation in urban China, my analysis will examine the participation of rural households in NCMS, the government-run health insurance in China.

Bendig and Arun (2011) analyzed the factors that influence participation in micro-insurance in Sri Lanka using a binary probit model. Micro-insurance is essentially regular insurance targeted at low-income people and it serves as a protection mechanism for poor households by risk pooling. Bendig and Arun found that female-headed and wealthier households are more likely to participate in micro health insurance. Education of the household head was found to be a strong indicator for participation in their study. They also found that the experience of illness or death in the household is significantly correlated with participation in micro health insurance.

The research in my study will use data from the Chinese Health and Nutrition Survey in a probit model. My model will further integrate additional factors of healthcare access and quality to determine their effect on individuals' decision to participate in insurance programs in rural China. To my knowledge there exists no study that has investigated the factors that determine medical insurance participation in rural China. Thus my study will provide valuable contribution to the literature. The findings of my research will be useful to define effective health care policies in rural areas.

III. Empirical Model

Because the dependent variable is binary, the popular probit model is adopted for this study. Specifically, a multivariate probit model is utilized to include multiple independent variables. The model estimates the probability that the event would occur. In my research, the model estimates the probability of an individual's decision to purchase medical insurance. The model will be heavily based on the model previously developed by Jütting (2003) and Mhere (2013). In both studies, similar models were used to

estimate the probability of enrollment in health insurance. When the response is binary, with value 1 as yes and 0 as no, the probit equation is specified as:

(1) $$P = Pr(Y=1|X) = \Phi(X'\beta)$$

where: Pr = probability

Φ = cumulative distribution function of the normal distribution

β = parameter, estimated by maximum likelihood

X = vector or regressors, assumed to influence outcome

Y = binary outcome, with value 1 or 0

In the study by Jutting (2003), insurance enrollment depends on household income, characteristics of household head, household characteristics, community characteristics and an error term. In the study by Mher (2013), additional variables, including nature of job and chronic illness, were incorporated to capture more socioeconomic characteristic of individuals and households. The model is further modified to incorporate healthcare access factors, fully specified as follows:

(2)

$$insurance = \beta 0 + \beta 1travC + \beta 2travT + \beta 3waitT + \beta 4fluC + \beta 5medAV + \beta 6chronic + \beta 7labor + \beta 8male + \beta 9hhincpc_{cpi} + \beta 10HS + \beta 11age + \beta 12wave + \varepsilon$$

The coefficients of the above probit model are estimated using maximum likelihood method in STATA. Because the coefficients of probit model are difficult to interpret, the built-in *margins, dydx* function is used to report the average marginal effect of the independent variables on the probability of insurance participation.

IV. Data

This study uses the data from the China Health and Nutrition Survey (CHNS), an ongoing longitudinal survey conducted by University of North Carolina at Chapel Hill, the Chinese Center for Disease Control and Prevention, and the National Institute of Nutrition and Food Safety. Started in 1989, the CHNS project aims to assess the impact of market reforms in China on nutrition and health behavior at the community, household and individual levels. The dataset includes detailed information on demographic, socioeconomic and health data about its subjects. A multi-stage, random cluster method was used to sample subjects from 9 provinces, including Huangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu,Liaoning, Shandong, as shown in Appendix 1. The first wave of data collection for this survey began in 1989 and additional waves were conducted in 1991, 1993, 1997, 2000, 2004, 2006, 2009 and 2011 respectively. The CHNS data is collected through a multistage, random cluster process, and hence captures the heterogeneity across communities. More detailed description of the design and method of the survey are described in Popkin et al. (2010).

This dataset is very useful for my research as it particularly includes various questions regarding access to medical services, including time, cost and method of travelling to medical facilities. Other related factors such as age, level of education, wage and type of employment are also recorded in the data files. These variables will mainly serve as control variables in my model to estimate the determinants of participation rate of individuals in the health insurance market. Location and wave categorical variables will also be included in my analysis for a closer examination of the data.

Because the New Cooperative Medical Scheme was initiated in 2003, the surveys conducted after 2003 will be used for this analysis. Also, to increase homogeneity of the subjects, individuals who indicated as "rural" will be extracted from the dataset. While most variables can be obtained directly from the dataset, "chronic," "labor" and "HS" are constructed from available variables. Chronic disease indicator, "chronic," is a binary variable which takes value 1 if the individual was diagnosed with hypertension, diabetes, myocardial infarction, apoplexy or stroke from physical exams, and 0 otherwise. Labor-intensive job, "labor," takes the value 1 if the primary job of the individual is self-reported as farmer, fisherman, hunter, logger or ordinary laborer, and 0 otherwise. Education level, "HS," takes the values 1, 2 or 3, corresponding to with less than, equal to, or higher than high school education.

In addition to the conventional variables for insurance participation, data related to physical access to healthcare will be emphasized in this paper. Time and cost of travelling to medical facilities will be the primary indicators for access. Other variables including average wait time and cost of common flu will also be included to signify convenience and quality of common healthcare. All the variables used for estimation in this paper are described in Table 1 and the descriptive statistics are provided in Table 2.

Table 1: Definitions of Specified Variables

Variable Name	Description
Insurance	Self-reported whether the individual has medical insurance. Insurance = 1 – having insurance Insurance = 0 – do not have insurance
travC	Cost, in RMB, of travelling to medical facility
travT	Time, in minutes, to bike or walk to closest medical facility
waitT	Average wait time to be seen by health worker
fluC	Cost, in RMB, of a common flu or cold treatment
medAv	Whether necessary treatment is usually available at the given medical facility, as reported by households medAv = 1 – necessary medicine is usually available
Chronic	Whether the individual is diagnosed with hypertension, diabetes, myocardial infarction, apoplexy and/or stroke; self-reported chronic = 1 – individual is diagnosed for one or multiple of the specified conditions
labor	Whether the primary occupation of the individual is labor-intensive, including farmer, fisherman, hunter and non-skilled labor labor = 1 – individual works as any of the above jobs
male	male = 1 – individual is male male = 2 – individual is female
hhincpc_cpi	Per capita household income, inflated to 2011 using CPI
HS	Highest education level achieved by the individual. Categories defined as: HS = 1 – below high school HS = 2 – high school HS = 3 – above high school
age	Age of the individual in years, to 2 decimals
wave	Year when the survey was conducted. Categories include: wave = 2004 wave = 2006

Table 2: Summary Statistics of Specified Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Insurance	11427	0.3493	0.4768	0	1
travC	11024	0.3346	2.1748	0	80
travT	11403	10.34	16.13	0	600
waitT	11325	6.344	11.753	0	410
fluC	11419	27.81	34.45	0	600
medAv	11378	0.9774	0.1486	0	1
chronic	11429	0.0865	0.2810	0	1
labor	11429	0.4232	0.4941	0	1
male	11429	0.4788	0.4996	0	1
hhincpc_cpi	11429	6433	7043	0	133282
HS	11429	1.253	0.571	1	3
age	11428	47.86	15.44	4.85	96.77
wave	11429	2005	1	2004	2006

V. Results and Discussion

The data used in this study is restricted to the individuals who have completed all portions of the survey corresponding to the specified variables. As a product of merging files, missing values were introduced, further limiting the sample size. Respondents are included in the data only if they are fully aware of their response; individuals with missing values and "unknown" as responses are excluded from this study. If the individual is not diagnosed with high blood pressure, diabetes, myocardial infarction or stroke, he or she is considered as not having chronic illness.

Before performing the regression, the correlation among the variables was calculated to check for multicollinearity. The correlation matrix is provided in Appendix 2. Correlations between the variables are all below 0.5, indicating that multicollinearity is not a significant problem in the data used for this analysis. While heteroscedasticity is often discussed for OLS regression, the concept cannot be easily applied to probit model.

Although a heteroscedastic probit model is available in STATA, it was not used due to the lack of strong theoretical reasoning to do so.

For each model, the Wald likelihood test is performed to ensure the significance of coefficients. For all models, the results indicated that the estimates of the coefficients are jointly statistically significant.

After completing the diagnostic tests, the Probit model defined in equation 2 was first used for estimation using the overall sample. The sample was then stratified by income tertiles to study the effect of the variables in the model on insurance participation rates at different levels of income. Lastly, the data was separated by gender to analyze and compare the effects of the variables on insurance participation among males and females.

a. Pooled Sample

In the first analysis, the probit regression was used to estimate using data on the entire pooled sample and the results are summarized in Table 3. The estimates presented in this table are the marginal effects on estimated probability for each unit increase of the explanatory variable. For example, for every extra minute it takes to travel to the closest medical facility, the probability of having medical insurance decreases by 0.2%. For dummy or categorical variables, the marginal effect represents the change from the base level. For example, individuals with education higher than high school would have 20% higher probability of having medical insurance than those with education level below high school in the pooled sample. As seen in Table 3, all the estimated coefficients are statistically significant at the 5% level.

Table 3: Estimates of Probit Analysis for the overall Sample

	dy/dx	Std. Err.
travC	0.0062***	0.0023
travT	-0.0020***	0.0004
Wait	-0.0029***	0.0005
fluC	0.0017***	0.0001
medAv	0.0772**	0.0290
Chronic	0.0610***	0.0160
Labor	0.0591***	0.0089
Male	0.0254***	0.0085
hhincpc_cpi	0.0000106***	0.0000
HS		
2	0.0929***	0.0140
3	0.1972***	0.0186
Age	0.0016***	0.0003
wave = 2006	0.2466***	0.0086

Notes: *** indicates significance at the 1% level.
** indicates significance at the 5% level

The result of this analysis implies that higher cost of travelling increases the probability of having medical insurance. It is possible that the travelling cost is considered as a part of medical cost when seeking care. Knowing that they will face higher costs when they fall sick, individuals will be more willing to purchase insurance to mitigate the financial burden. Similarly, higher cost of common flu treatment corresponds with higher insurance participation rate. These results imply that higher medical costs provide incentives for individuals to purchase insurance, because the benefit of insurance is greater when medical costs are higher.

On the other hand, travelling time and waiting time negatively correlate with insurance participation rate. Because the benefit of insurance can only be achieved via reimbursement through medical facilities, difficult healthcare access can inhibit individuals' willingness to pay for the premium. Under similar reasoning, if prescribed

medicine is not available, benefit or reimbursement cannot be obtained through medical insurance. The negative coefficients indicate that the lack of accessibility or availability of healthcare could prevent people from getting medical insurance.

The coefficients of male and labor-intensive job are positive as expected. Men are usually the ones working and providing income for the family. Since illness reduces men's ability to work, especially those participating in the lower-level and physical tasks, these laborers are more likely to have insurance as "alternative income" during periods of illness. Age and positive diagnosis of chronic disease also increase the probability of having medical insurance. Higher age often correlates with higher medical cost; frequent hospital visits and medication are often a result of chronic disease. People with these characteristics are more likely to invest in medical insurance to manage financial risk from medical causes. The significantly positive coefficient for the variable "wave" indicates the success of insurance coverage as a part of healthcare reform effort. People are much more likely to have insurance in 2006 than in 2004.

b. Income-Stratified Sample

While most of the specified variables in the model are expected to have similar effect at all income levels, some variables may change due to income effect. For example, travelling cost, which is often not reimbursed by medical insurance, may influence an individual's participation differently at different income levels. Therefore, the data was divided by income tertiles and analyzed separately. The results of this analysis are presented in table 4.

Table 4 – Income-stratified Probit Analysis

	Low Income		Middle Income		High Income	
	dy/dx	**Std. Err.**	**dy/dx**	**Std. Err.**	**dy/dx**	**Std. Err.**
travC	-0.0352***	0.0124	0.0057*	0.0031	-0.0036	0.0054
travT	-0.0013*	0.0007	-0.0004	0.0006	-0.0052***	0.0008
wait	-0.0035***	0.0009	-0.0007	0.0008	-0.0030***	0.0007
fluC	0.0015***	0.0002	0.0012***	0.0002	0.0021***	0.0002
1.medAv	0.0816*	0.0419	0.0961**	0.0427	0.0234	0.0588
1.chronic	0.0233	0.027	0.0248	0.0284	0.0904***	0.0244
1.labor	0.0715***	0.0145	0.0108	0.0157	0.0884***	0.0149
1.male	0.011	0.0138	0.0192	0.0153	0.0402***	0.0137
hhincpc_cpi	0.0000502***	0	0.0000221**	0	0.0000047***	0
HS						
2	-0.0101	0.0263	0.1099***	0.0274	0.1024***	0.0198
3	0.0007	0.0538	0.0881**	0.0429	0.2241***	0.0214
Age	0.0008*	0.0004	0.0017***	0.0005	0.0021***	0.0005
Wave						
2006	0.3309***	0.0141	0.2510***	0.0158	0.1911***	0.014
Observations	3070		3170		3170	

Notes: *** indicates significance at the 1% level.
** indicates significance at the 5% level.
* indicates significance at the 10% level.

As seen in table 4, the results are different for the three income tertiles. For the high income group, while availability of medication and cost of travelling became insignificant, the rest of the variables remain significant and maintain the sign of coefficients. In addition, chronic, labor and male variables have a stronger positive effect on insurance participation rate.

Many variables became insignificant for the middle-income bracket. The only remaining statistically significant factors at 5% level are fluC, medAV, hhincpc_cpi, HS and age; cost of travelling is significant at 10% level. The magnitude of effect of income for this group is larger than the high income group and the pooled sample.

For the low-income group, travC, travT, wait, fluC, labor and hhincpc_cpi remain significant factors. Given that the labor variable is negatively correlated to income, where poorer people are more likely to engage in labor-intensive occupation, the importance of labor is expected to increase for lower-income population and is reflected in the higher coefficient.

Interestingly, the sign of coefficient for travelling cost changed from positive to negative; cost of travelling became a factor that reduces insurance participation. This effect may be explained through the utility of wealth. For risk-averse individuals, the marginal utility of wealth is higher at lower levels of income; in other words, poor families tend to value a set amount of money more when they have less money in the bank. At lower levels of income, the value of travelling cost may outweigh the benefit of reimbursement from seeking healthcare and inhibit the desire for insurance participation.

Household per capita income remains significant at all income levels, with decreasing marginal effect at higher income level. The decreasing effect can also be explained by the utility theory of wealth. At higher income levels, the marginal utility of money diminishes, and income becomes a smaller decision factor.

c. Sex-Stratified Sample

Men and women have different socioeconomic status which influences their decision-making process. For example, 88% of the sampled individuals who did not have an occupation and chose to work at home were women (Appendix 3). Similarly, their participation in medical insurance can be affected differently by the specified variables in the model. Thus, the sub-groups of male and female are analyzed separately and the results are shown in Table 5.

Table 5 - Gender-Stratified Probit Analysis

	Male Sample		Female Sample	
	dy/dx	Std. Err.	dy/dx	Std. Err.
travC	0.0074**	0.0031	0.0018	0.0034
travT	-0.0016***	0.0006	-0.0030***	0.0007
waitT	-0.0024***	0.0006	-0.0035***	0.0008
fluC	0.0014***	0.0002	0.0019***	0.0002
1.medAv	0.0934**	0.0400	0.0672	0.0415
1.chronic	0.0498**	0.0220	0.0709***	0.0232
1.labor	0.0894***	0.0124	0.0255*	0.0131
hhincpc_cpi	0.00000984***	0.0000	0.0000112***	0.0000
HS				
2	0.094***	0.0221	0.0900***	0.0182
3	0.2051***	0.0284	0.1826***	0.0247
age	0.0012***	0.0004	0.0022***	0.0004
wave				
2006	0.2536***	0.0118	0.2398***	0.0126
Observations	5728		5241	

Notes: *** indicates significance at the 5% level.
** indicates significance at the 5% level.
* indicates significance at the 5% level.

The results are similar for males and females, with the estimates maintaining the same signs as in the pooled sample. While coefficients of travC and travT carry negative signs, fluC, chronic, labor, hhincpc_cpi, HS, and age variables continue to have positive impact on medical insurance participation rate. Also, medAv becomes statistically insignificant for female population. Notably, as expected, labor has a more positive and significant marginal effect for male than female population. Having a labor-intensive occupation increases the probability of insurance participation by 8.9% for male, but only 2.6% for female.

V. Conclusion

This study found that access to healthcare and availability of healthcare have significant effects on an individual's probability to participate in health insurance. Overall, the results support the hypothesis that physical inability or inconvenience to receive medical care inhibits the willingness to participate in medical insurance. This study found results similar to previous studies regarding healthcare-seeking behaviors, such as that by Zhang et al (2006). In particular, distance from home to various health sectors negatively impact rural farmer's willingness to join the new community-based health insurance program in rural China. Furthermore, this study contributes to the literature by integrating additional healthcare access and quality factors, such as the cost and time of travelling. Interestingly, cost of travelling can contribute either positively or negatively to the probability of joining medical insurance programs, depending on the income level of a given individual. The results of this research imply that designing an insurance program that is more closely based on customers' needs can maximize the effectiveness of the community based insurance program in China.

Starting 2009, the China Health and Nutrition Survey included additional questions about the reason for not having medical insurance. The surveys in 2009 and 2011 indicated that approximately 30% of respondents' answers for "reasons for not having insurance" as "reimbursement too small, not worth it" or "cannot afford, premium too high". This implies that 70% of uninsured individuals did not have medical insurance due to non-financial related factors (CHNS 2011). Given that the benefit of insurance stems from the utilization of healthcare, accessibility of medical facilities becomes a significant factor to consider when designing insurance policy. For example, public transportation

from villages to hospitals can be provided for rural residents to improve convenience of health care.

Overall, my research contributes to current literature by integrating both monetary and non-monetary factors for healthcare access. The significance of physical access found in my analysis proposes more investigation of the relationship between healthcare access and insurance participation. Further studies may include other relevant factors, such as reasons for not having insurance or distance to nearest hospitals that treat chronic illness. Additional analysis will facilitate the optimization of future health policy design to closely fit the need of target communities.

VI. Appendix

Appendix 1. Map of CHNS Participating Provinces

Appendix 2. Correlation of Specified Variables

	insura~e	travC	travT	waitT	fluC	medAv	chronic	labor	male	hhincp~i	HS	age	wave
insurance	1												
travC	0.0203	1											
travT	-0.0285	0.4026	1										
waitT	-0.0359	0.1109	0.1566	1									
fluC	0.1773	0.1376	0.1165	0.1773	1								
medAv	0.0564	0.015	-0.018	-0.0622	0.0513	1							
chronic	0.0609	0.0044	-0.0065	0.0138	0.0474	0.0106	1						
labor	0.0054	-0.0347	0.0055	-0.0932	-0.1077	-0.0161	-0.0998	1					
male	0.0415	-0.0006	-0.0018	0.0037	-0.0012	-0.0093	0	0.0319	1				
hhincpc_cpi	0.2108	0.0281	-0.021	0.033	0.1435	0.0302	0.0435	-0.1257	0.0261	1			
HS	0.1509	0.0195	-0.0151	0.071	0.1283	0.0178	-0.011	-0.2356	0.1142	0.2183	1		
age	0.0422	0.001	0.0256	0.0213	0.0071	-0.0072	0.2632	-0.0813	-0.0231	-0.0326	-0.1615	1	
wave	0.2908	0.0213	0.0288	-0.0007	0.1266	0.0721	0.0186	0.0227	-0.0063	0.0587	0.0336	0.0513	1

Appendix 3. Response for Not Working

Reasons for not having work	Female	Male	Total
seeking work	123	224	347
housework	1,642	238	1,880
disabled	35	52	87
student	20	33	53
retired	289	418	707
other	301	330	631
unknown	45	75	120
Total	2,455	1,370	3,825

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